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INTEROFFICE CORRESPONDENCE

DATE: November 6, 1991

TO: C. A. Patnoe, Clean Air, Bldg. 051, 273-6048

FROM: *C.D.* C. D. Cowdery, Environmental Research and Technology, Bldg. T130B, X5944

SUBJECT: REQUEST FOR GUIDANCE ON POTENTIAL OU 1 IM/IRA GROUNDWATER TREATMENT SYSTEM AIR EMISSIONS - CDC-103-91

As a follow-up to our recent telephone conversation, please provide guidance concerning potential air emissions from the Operable Unit No. 1 (OU 1) Interim Measure/Interim Remedial Action (IM/IRA) ground water recovery and treatment system; specifically, instruction is needed on whether it is possible to discharge volatiles in low concentrations without treatment and what kind of permitting would be required. I have attached the calculations estimating potential concentrations of volatiles. These calculations include several "worst-case" assumptions.

An expedient response is requested since this information affects the scope and design of the OU 1 IM/IRA groundwater treatment system currently being installed. Because this remediation is part of the Interagency Agreement (IAG), it has a tight schedule. Your time and consideration are appreciated.

CDC:cet

Attachment:
As Stated

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE

cc:

G. M. Anderson	-	w/o Attach.
M. B. Arndt	-	"
P. S. Bunge	-	"
M. C. Burmeister	-	"
T. C. Greengard	-	"
J. P. Koffer	-	"
D. H. Maxwell	-	"
G. H. Setlock	-	"

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"Worst Case" Assumption
Air Emissions For OU1, 881 Hillside
IM/IRA Ground Water Treatment System

The OU1 UV/Peroxide treatment system is a UV catalyzed oxidation process for the destruction of organic compounds in ground water. the process works by forming hydroxyl radicals which oxidize the organics. The products of this process are ideally carbon dioxide and water. There is some concern , however, that the carbon dioxide and oxygen (formed from hydroxyl radicals attacking each other) could volatilize some of the organic compounds before they can be oxidized.

In order to evaluate potential air emissions from the OU1 IM/IRA ground water treatment system, an evaluation of the volatilization of organic compounds had to be performed. It is believed that most of the volatilization will occur in the UV/peroxide treatment system and in the ion exchange surge tank. The gases that evolve from these two processes will likely be discharged through the vent pipe on the ion exchange surge tank (T-203). The ion exchange surge tank is one of four tanks that are situated on the south side of Building 891 housing the OU1 IM/IRA treatment system. Of the four tanks, the ion exchange surge tank is the northwest tank right next to the building.

Attached is a calculation of worst case air emission. It is possible that other organic compounds could occur at low concentrations. The gas itself will be primarily composed of oxygen and carbon dioxide, since the gases will be primarily the byproduct of oxidation processes. There is a possibility that chlorine, carbon monoxide, and other gases could exist in trace amounts. During the systems operations testing it is likely that the samples will be taken to verify that chlorine is not present.

In order to estimate the stack velocity, a volumetric flow rate of the gas is required. Based on visual observations of the September 25, 1991 UV/peroxide bench-scale test approximately 0.5 cu ft. of gas evolved from 3.5 gallons of water or 0.14 cu ft/gal of water treated. A maximum flow rate of 30 gpm of ground water would yield 4.3 cfm of gases. For a four inch outlet, the cross-sectional area would be 0.087 sq ft. Dividing the volumetric flow rate by the cross-sectional area yields a stack velocity of 49.1 ft/min. or 0.82 ft/s. The vent is currently set to discharge the gas downward towards the tank itself. The concentrations in the gas stream are also presented in the attached calculations.

In summary, the discharge should have the following estimated characteristics:

Volumetric Flow Rate:	4.3 cfm
Stack Velocity:	0.82 ft/s
Stack Discharge Direction:	Downward
Stack Diameter:	4 In.
Stack Cross- Sectional Area:	0.087 sq ft
Stack Discharge Height:	13.5 ft.
(From Ground Level)	

Worst Case Assumption For Air Emmissions
Of Volatiles

OU1, 881 Hillside IM/IRA
Treatment System

Assumptions:

- 1) This is a worst case assumption, so the flow rate of water to the system was the maximum used in the design of the treatment system (10 gpm)
- 2) The concentrations from a bench-scale test were used since these concentrations are from a recent composite sample of five representative wells
- 3) It was assumed that the pumps would be operating 24 hours a day, seven days a week.
- 4) It was assumed that all of the contaminants in the water would be completely volatilized and discharge into the air as opposed to being destroyed in the UV/peroxide process. This is a worst case assumption since some of the volatiles will be destroyed through peroxidation
- 5) Assume that the pressure is atmospheric and that the temperature is 25 degrees Celsius
- 6) Assume that the ideal gas law applies for purposes of determining the concentration in ppm
- 7) $R = 1.31 \text{ atm-cu ft / lb moles-deg K}$

Worst Case Assumption For Air Emissions
Of Volatiles
OU1, 881 Hillside IM/IRA
Treatment System

Influent 10 gpm
Flow Rate
Operating Time 8 hours
Treatment System 30 gpm
Flow
Vol. Gas Flow Rate 4.3 cfm

Compound	Bench-Scale		Worst Case		Air Emissions Concentrations (ppm)	Molecular Weight (lb/lb-mole)
	Concentration (ppb) *	Adjusted Concentration (ppb) **	Air Emissions (lb/hr)	Air Emissions (lb/day)		
Methylene Chloride ***	9.8	29.4	.00044	.00353	7.9	84.93
1,1-Dichloroethylene	780	2340	.03515	.28121	548.7	96.94
1,1-Dichloroethane	3.1	9.3	.00014	.00112	2.1	98.96
Chloroform	1.7	5.1	.00008	.00061	1.0	119.38
1,2-Dichloroethane	4.2	12.6	.00019	.00151	2.9	98.96
1,1,1-Trichloroethane	1100	3300	.04957	.39657	562.2	133.41
Carbon Tetrachloride	29	87	.00131	.01046	12.9	153.82
Trichloroethylene	1000	3000	.04507	.36052	519.0	131.39
1,1,2-Trichloroethane	11	33	.0005	.00397	5.6	133.41
Tetrachloroethylene	130	390	.00586	.04687	53.5	165.83
Trichlorofluoromethane	2.8	8.4	.00013	.00101	1.4	137.3654

* Highest values from preliminary analysis from 9/25/91
bench-scale on UV/peroxide system (chemical analysis
done by Weston-Gulf Coast)

** Adjusted concentration is 3 times the measured concentration
to compensate for diluting the water after the sample
was taken in order to model expected concentrations.

*** Methylene chloride was found in the laboratory blank

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